Simulation design matters

Valorization

This Chapter meets the requirements of Article 22 of the Regulation Governing the Attainment of Doctoral Degrees on the inclusion of a valorization paragraph in all PhD dissertations at Maastricht University as of 1 September 2014. Knowledge valorization is the "process of creating value from knowledge by making knowledge suitable for translation into competitive products, services, processes and new commercial activities".

Relevance. The studies presented in this thesis demonstrate positive training outcomes of an instructional design based obstetrics simulation training. The practical implications of these findings may be found on several fronts – from responding to demands on continuous healthcare education to positive impacts on patient outcomes.

The need for evidence-based simulation training which makes good use of instructional design principles emanated from the high budget demands of this training strategy. After initial euphoria, simulation training needed to be optimized and its effectiveness needed to be soundly proved[1]. This thesis may then contribute to this aim by presenting an effective simulation training format that can be potentially applied to multiple different training contents.

The presented studies explored the outcomes of instructional design based simulation training and the selected training content was postpartum hemorrhage (PPH), the leading cause of maternal deaths worldwide[2]. Maternal mortality rates remain unacceptably high, despite the verified global improvement over the past decades, especially because the majority of cases are considered preventable. Management failures frequently associated with high mortality rates are described as miscommunications, teamwork malfunction, and lack of situational awareness[3,4]. Therefore, the positive training outcomes of the explored simulation training may span across several domains beyond PPH clinical management itself.

This thesis aimed to contribute to demands from the international scientific community within a global perspective. However, presenting the

local context at which the studies were conducted may further contribute to reflections upon their relevance. The studies were conducted in the city of Recife, located in the Northeast region of Brazil, a middle-income country. The Northeast region holds 30% of the Brazilian population and accounts for 13% of Brazil's GDP. Its wide socio-economical inequalities lead to healthcare assistance challenges varying from those encountered by high-income countries to those from low-income countries. In spite of improvements on maternal mortality rates, women still die at high rates worldwide, but foremost in low-and-middle-income countries (LMIC).

Brazilian healthcare coverage is free and universal since the creation of Brazil's Sistema Único de Saúde (SUS) by the 1988 Brazilian Constitution. Along with healthcare assistance among SUS attributions lays the planning and provision of healthcare professionals continuous education[5]. Therefore, healthcare policy makers and healthcare community are continuously in search for effective healthcare personnel training and the findings from this thesis may be largely welcomed in benefit of maternal healthcare assistance.

In addition to the challenges encountered by maternal healthcare professionals worldwide, those in LMIC face a daily stressful routine of work overload and personnel shortage. Such reality leads to undesirable neglect to quality assistance and patient safety compromise. However, improving patient safety and quality of care may be achieved through effective personnel training and does not necessarily demand prohibitively expensive investments. By providing effective simulation training, a positive impact may be perceived in several key perspectives: from avoiding patient harm in its individual consequences and societal economical burden to introducing a safe learning environment and a culture in which errors are viewed as an opportunity for learning[6].

Effective strategies contributing to the reduction of maternal mortality benefit society as a whole. In societies economically still under development and with fragile institutions, the absence of a mother brings even further significant compromise to the offspring in various different aspects (vaccination rates completion, neurocognitive development and academic outcomes)[2]. As long as the goal of safe pregnancy and childbirth for all women and all

girls in all countries is still not reached, research and innovation are essential ingredients for success[7]. Therefore, providing effective evidence based postpartum hemorrhage simulation training may significantly contribute to improve our current prospect.

Target groups. Our findings on effective evidence-based simulation training using instructional design principles may benefit healthcare professionals who are in constant need of updating their knowledge, skills and overall competencies. Healthcare professionals are constantly facing changes in an evolving society, from technological advances to interpersonal interactions. Their continuous demands for complex learning and proper integration of a wide range of training contents may find an effective response strategy in simulation training. In addition, such training strategy may also contribute to their need to self-regulate the deep foundations of the psychological sciences of clinical reasoning[8,9].

Overall, healthcare policy makers and stakeholders may also benefit from our presented findings. For those in charge of providing strategies for healthcare professionals to succeed in their continuous search for up-to- date knowledge and skills becoming aware of effective simulation training designs that are easily applicable and reproducible is a helping hand.

Activities/Products/Schedule & Implementation. As previously described, the studies reported in this thesis were conducted in Recife, a city located in the impoverished Northeast region of Brazil. Therefore, it represents a large potential to contribute to the local healthcare system. Our aim is to offer instructional design based simulation trainings in a wide range of contents to healthcare professionals across clinical disciplines.

As a first step, the presented PPH training will be replicated at the Maternity where the studies were conducted, Instituto de Medicina Integral Prof. Fernando Figueira (IMIP), to incoming residents and healthcare teams. Then, the training will be amplified to other epidemiological relevant contents such as eclampsia and sepsis. In sequence, it should be further offered to other healthcare professionals and residents from other disciplines, to further promote teamwork interactions. Later, rare-event contents will be also incorporated and offered as simulation training for the multidisciplinary healthcare teams.

In a longer-term perspective, the plan is to offer effective simulation training to healthcare professionals outside the institution. A simulation training and innovation research center is currently being planned and developed to accommodate training routine to a wider audience through an agreement with healthcare policy makers. The schedule for inauguration is predicted for late 2019.

Innovation. The simulation training format explored in the reported studies provided opportunity for repetitive practice through a variation of multiple clinical scenarios presented in a simple-to-complex sequence. Multiple debriefing opportunities were also provided. Such design led to significant positive learning outcomes, long-term transfer and a positive impact on patient outcomes. These findings and design represent a long-awaited innovation at the current frontier of knowledge in healthcare simulation training research and their benefits were soundly demonstrated[10,11].

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